

WHAT IS CLAIMED IS:

- 1                   1.       A system for modifying a valve in a patient's heart to reduce  
2 regurgitation, the valve having an annulus, the system comprising:  
3                   a catheter configured for advancement through the patient's vasculature  
4 into the heart from a vascular access point remote from the heart; and  
5                   a supporting structure releasably coupled to the catheter, the supporting  
6 structure being adapted for deployment at a tissue location on or near the annulus, the  
7 supporting structure being movable between a delivery configuration suitable for  
8 advancement through the patient's vasculature and a deployed configuration suitable for  
9 modifying the annulus when deployed at the tissue location so as to reduce regurgitation  
10 in the valve.
- 1                   2.       The system of claim 1 wherein the supporting structure comprises a  
2 ring adapted to at least partially surround the annulus.
- 1                   3.       The system of claim 1 wherein the supporting structure is elastic  
2 and moves from the delivery configuration to the deployed configuration upon  
3 deployment from the catheter.
- 1                   4.       The system of claim 1 wherein the supporting structure is  
2 expandable from the delivery configuration to the deployed configuration.
- 1                   5.       The system of claim 4 further comprising an expansion element on  
2 the catheter for expanding the supporting structure.
- 1                   6.       The system of claim 5 wherein the expansion element comprises a  
2 balloon.
- 1                   7.       The system of claim 5 wherein the expansion element comprises a  
2 plurality of spokes.
- 1                   8.       The system of claim 1 further comprising a fastener for fastening  
2 the supporting structure to tissue.
- 1                   9.       The system of claim 8 wherein the fastener comprises suture.
- 1                   10.      The system of claim 8 wherein the fastener comprises a staple.

- 1                    11.    The system of claim 1 wherein the supporting structure is  
2 configured to circumferentially shorten the annulus.
- 1                    12.    The system of claim 1 wherein the supporting structure is  
2 configured for deployment over the annulus.
- 1                    13.    The system of claim 1 wherein the supporting structure is adapted  
2 for adhesive attachment to tissue.
- 1                    14.    The system of claim 1 wherein the catheter is configured to extend  
2 into the heart from a femoral venous location.
- 1                    15.    The system of claim 1 wherein the catheter is configured to extend  
2 across an inter-atrial septum of the heart.
- 1                    16.    The system of claim 1 wherein the valve is the mitral valve, the  
2 supporting structure being adapted for modifying the annulus of the mitral valve in the  
3 deployed configuration.
- 1                    17.    The system of claim 1 further comprising a guide catheter  
2 configured for advancement through the patient's vasculature into the heart from the  
3 vascular access point remote from the heart, the catheter and the supporting structure  
4 being positionable through the guide catheter.
- 1                    18.    The system of claim 1 wherein the supporting structure is  
2 configured to tighten the annulus.
- 1                    19.    The system of claim 1 wherein the supporting structure is  
2 deformable from the delivery configuration to the deployed configuration.
- 1                    20.    A method of modifying a valve in a patient's heart to reduce  
2 regurgitation, the valve having an annulus, the method comprising:  
3                    advancing a catheter through the patient's vasculature into the heart from a  
4 vascular access point remote from the heart, the catheter having a supporting structure  
5 releasably coupled thereto in a delivery configuration; and  
6                    deploying the supporting structure from the catheter at a tissue location on  
7 or near the annulus, the supporting structure having a deployed configuration upon

8 deployment, the supporting structure modifying the annulus so as to reduce regurgitation  
9 in the valve.

1                   21.     The method of claim 20 wherein the supporting structure  
2 comprises a ring, and wherein deploying comprises deploying the supporting structure so  
3 that the ring at least partially surrounds the annulus.

1                   22.     The method of claim 20 wherein the supporting structure is elastic  
2 and wherein deploying includes elastic recoil movement of the supporting structure from  
3 the delivery configuration to the deployed configuration upon deployment from the  
4 catheter.

1                   23.     The method of claim 20 wherein deploying comprises expanding  
2 of the supporting structure from the delivery configuration to the deployed configuration.

1                   24.     The method of claim 23 wherein expanding comprises using an  
2 expansion element on the catheter to expand the supporting structure.

1                   25.     The method of claim 24 wherein the expansion element comprises  
2 a balloon and using the expansion element comprises inflating the balloon.

1                   26.     The method of claim 24 wherein the expansion element comprises  
2 a plurality of spokes and using the expansion element comprises opening the plurality of  
3 spokes.

1                   27.     The method of claim 20 further comprising fastening the deployed  
2 supporting structure to tissue with a fastener.

1                   28.     The method of claim 27 wherein the fastener comprises suture.

1                   29.     The method of claim 27 wherein the fastener comprises a staple.

1                   30.     The method of claim 20 wherein modifying the annulus by the  
2 supporting structure comprises circumferentially shortening the annulus.

1                   31.     The method of claim 20 wherein deploying the supporting structure  
2 comprises deploying the supporting structure over the annulus.

- 1                   32.     The method of claim 20 further comprising fastening the  
2     supporting structure to tissue with adhesive.
- 1                   33.     The method of claim 20 wherein advancing the catheter comprises  
2     advancing the catheter from a femoral venous location.
- 1                   34.     The method of claim 20 wherein advancing the catheter comprises  
2     advancing the catheter across an inter-atrial septum of the heart.
- 1                   35.     The method of claim 20 wherein the valve is a mitral valve, the  
2     supporting structure modifying the annulus of the mitral valve.
- 1                   36.     The method of claim 20 further comprising positioning a guide  
2     catheter through the patient's vasculature into the heart from the vascular access point  
3     remote from the heart, and wherein advancing the catheter comprises advancing the  
4     catheter through the guide catheter.
- 1                   37.     The method of claim 20 wherein modifying the annulus comprises  
2     tightening the annulus.
- 1                   38.     The method of claim 20 wherein deploying comprises deforming  
2     of the supporting structure from the delivery configuration to the deployed configuration.
- 1                   39.     A method of modifying a valve in a patient's heart to reduce  
2     regurgitation, the valve having an annulus, the method comprising:  
3                   advancing a catheter through the patient's vasculature into the heart from a  
4     vascular access point remote from the heart, the catheter having an annuloplasty device  
5     releasably coupled thereto; and  
6                   deploying the annuloplasty device on or near the annulus so as to modify  
7     the annulus to reduce regurgitation in the valve.
- 1                   40.     The method of claim 39 wherein the annuloplasty device is  
2     disposed in a delivery configuration while advancing the catheter through the patient's  
3     vasculature, and wherein deploying the annuloplasty device comprises expanding the  
4     annuloplasty device into a delivery configuration suitable for modifying the annulus.

1                   41.     The method of claim 39 wherein modifying the annulus comprises  
2 shortening the annulus.

1                   42.     The method of claim 39 wherein modifying the annulus comprises  
2 tightening the annulus.

1                   43.     A method of modifying a valve in a patient's heart to reduce  
2 regurgitation, the valve having an annulus, the method comprising:  
3                   advancing a catheter through the patient's vasculature into the heart from a  
4 vascular access point remote from the heart, the catheter carrying a plurality of anchors;  
5                   placing the anchors on or near the annulus;  
6                   coupling a filament to the anchors; and  
7                   tightening the filament so as to modify the annulus to reduce regurgitation  
8 in the valve.

1                   44.     A method of modifying a valve in a patient's heart to reduce  
2 regurgitation, the valve having an annulus, the method comprising:  
3                   advancing a catheter through the patient's vasculature into the heart from a  
4 vascular access point remote from the heart, the catheter carrying a plurality of staples;  
5 and  
6                   applying the staples to tissue on or near the annulus so as to modify the  
7 annulus to reduce regurgitation in the valve.

1                   45.     A method for repairing an atrioventricular valve, said method  
2 comprising:  
3                   accessing a patient's vasculature remote from a heart;  
4                   advancing an interventional catheter through the vasculature into the heart,  
5 the interventional catheter having an interventional tool at a distal end thereof;  
6                   delivering an implantable device through the interventional catheter to a  
7 target location in the heart with the use of the interventional tool; and  
8                   modifying the annulus with the use of the implantable device in a manner  
9 that reduces leakage through the valve during ventricular systole.

1                   46.     A method as in claim 45 wherein the implantable device comprises  
2 a supporting structure and modifying the annulus comprises attaching the supporting  
3 structure to the annulus.

1                   47.     A method as in claim 46 wherein the supporting structure  
2 comprises a ring and modifying the annulus comprises affixing the ring around the  
3 circumference of the annulus.

1                   48.     A method as in claim 47, wherein the interventional tool comprises  
2 a balloon and delivering the implantable device comprises expanding the balloon having  
3 the ring mounted thereon within the annulus.

1                   49.     A method as in claim 45, wherein the implantable device  
2 comprises a plurality of anchors and modifying the annulus comprises circumferentially  
3 tightening the annulus by drawing at least some of the plurality of anchors together.

1                   50.     A method as in claim 45, wherein the implantable device  
2 comprises a plurality of plicators and modifying the annulus comprises circumferentially  
3 tightening the annulus by plicating portions of the annulus with the plicators.